



## Complete Summary

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### GUIDELINE TITLE

Specific assessment. In: I guidelines for perioperative evaluation.

### BIBLIOGRAPHIC SOURCE(S)

Committee on Perioperative Evaluation (CAPO), Brazilian Society of Cardiology. Specific assessment. In: I guidelines for perioperative evaluation. Arq Bras Cardiol 2007;89(6):e186-94. [38 references]

### GUIDELINE STATUS

This is the current release of the guideline.

### \*\* REGULATORY ALERT \*\*

### FDA WARNING/REGULATORY ALERT

**Note from the National Guideline Clearinghouse:** This guideline references a drug(s) for which important revised regulatory information has been released.

- [August 16, 2007, Coumadin \(Warfarin\)](#): Updates to the labeling for Coumadin to include pharmacogenomics information to explain that people's genetic makeup may influence how they respond to the drug.

### COMPLETE SUMMARY CONTENT

\*\* REGULATORY ALERT \*\*

SCOPE

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### SCOPE

### DISEASE/CONDITION(S)

Any condition requiring surgery associated with:

- Coronary artery disease
- Hypertension
- Congestive heart failure
- Valvular heart disease
- Cardiac arrhythmias (with or without implantable pacemakers or cardioverter-defibrillators)
- Atrioventricular or intraventricular conduction disorders
- Organ transplants
- Pregnancy
- Periodontal infection
- Endodontic infection

### **GUIDELINE CATEGORY**

Evaluation  
Management  
Prevention  
Risk Assessment  
Treatment

### **CLINICAL SPECIALTY**

Anesthesiology  
Cardiology  
Critical Care  
Dentistry  
Gastroenterology  
Hematology  
Infectious Diseases  
Nephrology  
Obstetrics and Gynecology  
Surgery  
Thoracic Surgery

### **INTENDED USERS**

Physician Assistants  
Physicians

### **GUIDELINE OBJECTIVE(S)**

- To refine and unify the terminology used by the entire multidisciplinary team, including the patients and their family
- To establish new routines, change indication for surgery according to the information obtained during the perioperative evaluation

### **TARGET POPULATION**

Any patient who requires surgery

## **INTERVENTIONS AND PRACTICES CONSIDERED**

### **Risk Assessment/Management/Prevention**

1. Determination of cardiac functional status
2. Cardiology referral
3. Sequencing surgery
4. Management of implantable pacemakers and cardioverter-defibrillators
5. Avoidance of arrhythmogenic anesthetics
6. Additional testing in pregnancy
7. Blood pressure regulation
8. Electrolyte regulation
9. Blood volume management
10. Infective endocarditis prophylaxis
11. Management of anticoagulation therapy (heparin, warfarin)

## **MAJOR OUTCOMES CONSIDERED**

- Perioperative complications
- Perioperative mortality
- Morbidity and mortality in pregnant women
- Fetal morbidity and mortality

## **METHODOLOGY**

### **METHODS USED TO COLLECT/SELECT EVIDENCE**

Searches of Electronic Databases

### **DESCRIPTION OF METHODS USED TO COLLECT/SELECT THE EVIDENCE**

Not stated

### **NUMBER OF SOURCE DOCUMENTS**

Not stated

### **METHODS USED TO ASSESS THE QUALITY AND STRENGTH OF THE EVIDENCE**

Weighting According to a Rating Scheme (Scheme Given)

### **RATING SCHEME FOR THE STRENGTH OF THE EVIDENCE**

#### **Levels of Evidence**

- A. Sufficient evidence from multiple randomized trials or meta-analyses
- B. Limited evidence from single randomized trial or non-randomized studies
- C. Evidence only from case reports and series
- D. Expert opinion or standard of care

## **METHODS USED TO ANALYZE THE EVIDENCE**

Systematic Review

## **DESCRIPTION OF THE METHODS USED TO ANALYZE THE EVIDENCE**

Not stated

## **METHODS USED TO FORMULATE THE RECOMMENDATIONS**

Expert Consensus

## **DESCRIPTION OF METHODS USED TO FORMULATE THE RECOMMENDATIONS**

The participants of these guidelines were chosen among health sciences specialists with hands on and academic experience, thus being characterized as clinical researchers.

The adopted methodology and evidence levels were the same as those used in earlier documents by the Brazilian Society of Cardiology.

### **Recommendations**

- The guidelines must be based on evidences.
- Class division must be used when applicable.
- Degrees of recommendation must be used when applicable, according to the levels of evidence.

## **RATING SCHEME FOR THE STRENGTH OF THE RECOMMENDATIONS**

### **Degree or Class of Recommendation**

**Class I:** Conditions for which there is evidence for and/or general agreement that the procedure/therapy is useful and effective

**Class II:** Conditions for which there is conflicting evidence and/or a divergence of opinion about the usefulness/efficacy of performing the procedure/therapy

**Class IIa:** Weight of evidence/opinion is in favor of usefulness/efficacy

**Class IIb:** Usefulness/efficacy is less well established by evidence/opinion

**Class III:** Conditions for which there is evidence for and/or general agreement that the procedure/therapy is not useful/effective and in some cases may be harmful

## **COST ANALYSIS**

A formal cost analysis was not performed and published cost analyses were not reviewed.

## METHOD OF GUIDELINE VALIDATION

Peer Review

## DESCRIPTION OF METHOD OF GUIDELINE VALIDATION

Not stated

## RECOMMENDATIONS

### MAJOR RECOMMENDATIONS

The definitions for levels of evidence (A-D) and classes of recommendation (I-III) are provided at the end of the "Major Recommendations" field.

#### Hypertension

- If blood pressure is high and there is time enough time before surgery to reduce it with proper medications, do so; **Class I, Level of Evidence D.**
- If blood pressure is high and there is not enough time before surgery to reduce it with proper medications, administer a cardioselective beta-1 receptor blocker with rapid onset (esmolol) to keep the blood pressure from rising during intubation. Clonidine can be used when esmolol is contraindicated; **Class I, Level of Evidence C.**
- The antihypertensive medication (including angiotensin converting enzyme [ACE] inhibitors) must be continued during the perioperative period, including on the day of the procedure. **Class I, Level of Evidence D.**
- If the patient's potassium level is low, intravenous administration of potassium is recommended; **Class I, Level of Evidence D.**
- The reintroduction of antihypertensive medication, preferably the one that the patient was using before surgery, should be done as soon as possible. **Class I, Level of Evidence D.**
- Volume management should be rigorous during the perioperative period. **Class I, Level of Evidence C.**

#### Congestive Heart Failure (CHF) Class I, Level of Evidence D

- Assessment of patients with CHF symptoms must focus on determining its etiology and the patients functional class (New York Heart Association [NYHA])
- Treatment must be optimized before surgery and patient must continue to take medications during the entire perioperative period (including the day of surgery)
- Anesthetic agents that depress myocardial contractility must be avoided in patients with CHF
- Volume management must be rigorous. Invasive monitoring can be useful during the intraoperative and early postoperative periods of patients with severely depressed cardiac function

- Careful evaluation of the fluid and electrolyte balance must be done

### **Valvular Heart Disease**

- Patients with valvular heart disease should be referred to a cardiologist before surgery; **Class I, Level of Evidence D.**
- Patients with valvular lesion, especially aortic stenosis, with indication for corrective surgery, should have their heart disease corrected before being submitted to non-cardiac surgery whenever possible; **Class I, Level of Evidence C.**
- Control of blood volume and electrolytic disorders must be given special attention during the entire perioperative period; **Class I, Level of Evidence D.**
- When appropriate, prophylaxis of infective endocarditis should be done; **Class I, Level of Evidence D.**
- The level of anticoagulation must be well adjusted in order to avoid hard-to-control bleeding. The use of heparins should follow current guidelines; **Class I, Level of Evidence C.**

### **Cardiac Arrhythmias and Conduction Disorders**

#### **Cardiac Arrhythmias**

##### *Refer for Cardiologist Assessment*

- Patients with symptoms that are associated with
  - Low output or syncope, structural heart disease associated with compromised left ventricular systolic function and/or myocardial ischemia; **Class I, Level of Evidence D.**
  - Tachyarrhythmia in patients with ventricular preexcitation syndrome with sudden onset and termination, without clinical findings or adequate treatment; **Class I, Level of Evidence D.**
  - Tachyarrhythmias, regardless of structural heart disease, in patients with well-defined, frequent and recent symptoms of tachycardia episodes of sudden onset and termination; **Class IIa, Level of Evidence D.**
  - Low output or syncope in elderly patients with a resting heart rate below 50 bpm; **Class IIa, Level of Evidence D.**
- In the absence of symptoms
  - In patients with permanent atrial fibrillation to assess control of heart rhythm; **Class IIa, Level of Evidence D.**
  - In patients with very frequent ventricular arrhythmias or repetitive ventricular arrhythmias associated with structural heart disease; **Class IIa, Level of Evidence D.**

#### **Atrioventricular (AV) and Intraventricular Conduction Disorders**

##### *Refer for Cardiologist Assessment*

- Patients with AV blocks

- Severe AV blocks: Type II second-degree AV block, 2:1 AV block, paroxysmal or permanent complete AV block or AV dissociation; **Class I, Level of Evidence D.**
- Mild AV block in the resting electrocardiogram (ECG) but with symptoms that suggest low output or syncope; **Class IIa, Level of Evidence D.**
- Intraventricular blocks
  - Trifascicular block; **Class IIa, Level of Evidence D.**
  - Bifascicular block in the resting electrocardiogram (ECG) but with symptoms that suggest low output or syncope; **Class IIa, Level of Evidence D.**

## **Implantable Pacemakers and Cardioverter-Defibrillators**

### **In the Preoperative Period**

- Determine if the patient uses a single or dual chamber pacemaker, resynchronizer, defibrillator or multiple prostheses; **Class I, Level of Evidence D.**
- Check the identification card, radiological identification number or hospital records to determine what type of device the patient is using; **Class I, Level of Evidence D.**
- Determine if the patient depends on the pacemaker by reviewing previous assessments, asking the patient if they had syncope or dizziness before the implant or decreasing the timing of the device to the lowest rate and observing if an escape focus occurs and its stability; **Class I, Level of Evidence D.**
- Determine the function of the pacemaker. This requires a specific previous assessment of the device and adjusting the settings. If it is impossible to adjust its settings, check if there is an effective pacemaker pacing artifact (that generates pacing) in the ECG; **Class IIb, Level of Evidence D.**

### **In the Intraoperative Period**

- All patients must be monitored by continuous ECG and plethysmography (or auscultation, pulse palpation or ultrasound) regardless of the type of anesthesia; **Class I, Level of Evidence C.**
- Electrocautery **Class I, Level of Evidence D**
  - Continuous cardiac monitoring with ECG monitor and pulse oximetry (heart rhythm monitoring is possible even during electrocautery)
  - Use bipolar electrocautery. If bipolar is not available, use monopolar electrocautery but place the grounding pad far from the pacemaker and make sure to use a conducting gel
  - Ground the electrocautery device properly by connecting it to a good grounding wire
  - Limit the use of the electrocautery probe as much as possible and to very short periods and always monitor the ECG or heart rate
  - If bradycardia or tachycardia occur during electrocautery (because of electromagnetic interference), place a magnet over the pacemaker every time the electrocautery probe is used. Note that if the magnet is placed correctly, the pacemaker stimulates the heart with a fixed heart rate

- Avoid using arrhythmogenic agents during anesthesia (sympathomimetic and/or atropine-like agents)
- Avoid volume overload and if possible, keep the patient in the slightly elevated reclined position
- Remind the patient to return to the pacemaker checkup clinic after the postoperative recovery period so that the original settings can be restored and the pacemaker reassessed.
- Radiofrequency ablation: place the grounding pads far from the generator and leads and do not allow the ablation catheter to touch the pacemaker's leads

**Class I, Level of Evidence C**

- Lithotripsy (Drach, Weber, & Donovan, 1990): do not focus the lithotripsy beam toward the pacemaker and leads. Turn off atrial stimulation when using ECG-triggered lithotripsy; **Class IIa, Level of Evidence D**
- Cardioversion or defibrillation **Class I, Level of Evidence D**
  - Internal cardioversion is preferred in patients with internal (implantable) cardioverter-defibrillator (ICD) since it uses less energy, biphasic pulse and internal safety resources of the device itself
  - Prefer cardioverters that come with adhesive pads. Place them anteroposteriorly, according to the polarity informed by the manufacturer. Avoid the standard placement of the pads (between the base and tip of the heart – parallel to the leads) since the myocardium may be injured by the tip of the lead
  - Attach the pads as far as possible from the generator and leads
  - Use as little energy as possible. Modern cardioverters delivering biphasic shocks should be preferred
  - Place a magnet over the generator of the pacemaker (not over that of the ICD because if a magnet remains over them for more than 30 seconds, it can disable the antitachycardia function). This attitude leads to two different responses: the sensing circuit of older pacemakers invariably shuts down when a magnet is placed over them and become asynchronous. Conversely, modern rate-responsive devices are programmable and can have different behaviours. Thus, placing a magnet over the generator does not necessarily protect the device during a cardioversion.
  - Verify the sensing and pacing thresholds after the procedure. Consider reassessing the device in 24 hours and monitor the patient during this time.

**In the Postoperative Period: Class I, Level of Evidence D**

- Heart rate and rhythm must be continuously monitored during the postoperative period
- Cardioversion/defibrillation equipment and resources for cardiac stimulation must be available
- If the functions of the pacemaker were changed for surgery, reprogram it back to its usual settings as soon as possible

**Organ Transplants**

- Use non-invasive methods to determine if kidney and liver transplant candidates with risk factors for coronary artery disease have ischemic heart disease; **Class IIa, Level of Evidence D.**

- When revascularization is indicated for patients with coronary artery disease, it should precede transplant surgery; **Class IIa, Level of Evidence D.**
- Investigate if liver transplant candidates have pulmonary hypertension before submitting them to liver transplant; **Class IIa, Level of Evidence D.**
- Transplant indication must be reassessed if there is severe comorbidity with unfavorable short-term prognosis; **Class I, Level of Evidence D.**

## Heart Disease and Pregnancy

### Recommendations on Additional Tests (National Commission on Radiation Protection, 1987)

- Resting or dynamic ECG and Doppler echocardiogram do not pose any risk for mother or fetus; **Class I, Level of Evidence D.**
- Chest x-ray should not be used routinely during pregnancy; **Class I, Level of Evidence C.**
- Myocardial scintigraphy is not advised because the fetus can be exposed to ionizing radiation. If absolutely necessary, use technetium-99m and thallium-201 scintigraphy; **Class IIb, Level of Evidence C.**
- Gallium-67 scintigraphy is always contraindicated during pregnancy; **Class I, Level of Evidence C.**
- When hemodynamic studies are needed, make sure to protect the abdomen; **Class I, Level of Evidence C.**
- Nuclear magnetic resonance is not contraindicated during pregnancy; **Class I, Level of Evidence C.**

### Recommendations for Surgeries in Pregnant Women

- Delaying indication for surgery and surgery itself are the main causes for morbidity and mortality
- The second trimester of pregnancy is the safest for the mother and fetus
- Conventional surgical techniques should not be modified because of pregnancy
- Serial assessment of fluid and electrolyte balance and hematocrit and hemoglobin levels
- The pregnant uterus should not be allowed to compress the inferior vena cava during surgery
- An efficient analgesia prevents preterm birth
- Gastrointestinal decompression prevents emesis and aspiration
- Insure efficient pre-oxygenation before induction and intubation
- Prevent paralytic ileus
- Avoid using too much crystalloid solution in the intraoperative infusion
- Avoid using solutions containing glucose when delivery is imminent to reduce the risk of neonatal hypoglycemia
- Insert a Foley catheter to prevent build up of urine in the bladder
- Maintain the standard antibiotic therapy
- Pay special attention to lower limb edema as it increases the risks of phlebitis caused by prolonged inactivity and postoperative thromboembolism
- Do not encourage early ambulation to avoid preterm birth
- Administer vaginal progesterone to prevent premature labor (250 mg/day)

### Recommendations for Prevention of Thromboembolism

- Heparin is the anticoagulant of choice for pregnant women as it does not cross the placental barrier and is not harmful to the fetus ("Brazilian consensus," 1999); **Class I, Level of Evidence A.**
- Although still controversial, preoperative anticoagulation therapy for high risk patients is 12 UI/kg/hour of nonfractionated intravenous (iv) heparin controlled by activated partial thromboplastin time (1.5 times the relation of partial thromboplastin times [PTTs]) or 1 mg/kg/day of low-molecular-weight heparin (enoxaparin) at 12-hour intervals. For patients at moderate risk, the recommendation is 10,000 UI of subcutaneous nonfractionated heparin at 12-hour intervals or subcutaneous low-molecular-weight heparin (enoxaparin) at 40 mg/day. Suspend the use of non-fractionated heparin 4 hours before surgery and low-molecular-weight heparin 18 hours before surgery, reintroducing them 6 hours after surgery ("Brazilian consensus," 1999). **Class IIb, Level of Evidence C.**

## **Dental Procedures**

### **General Recommendations**

- Patients on optimal medication therapy for heart disease can safely undergo dental procedures and do not require special care; **Class I, Level of Evidence D.**
- The use of anesthetics with vasoconstrictors should be avoided during acute phases of coronary events, cardiac arrhythmias with rapid ventricular response, hyperadrenergic states or left ventricular outflow obstruction; **Class I, Level of Evidence D.**
- Pacemakers and automatic internal cardiac defibrillators are not affected by high or low rotation speed drills, amalgam mixer, electrical pulp testing, laser, electric toothbrushes, endodontic ultrasound and radiography. There are specific recommendations for electrocautery (see Section F-I.3, Safe cardiac stimulation, in the original guideline document); **Class I, Level of Evidence C.**

### **Recommendations for Dental Procedures in Patients on Anticoagulation Therapy**

- Warfarin should not be discontinued in patients who are not at high risk of bleeding; **Class I, Level of Evidence D.**
- Patients at high risk of bleeding should stop warfarin and the procedure could be done when international normalized ratio (INR) is under 1.5. If the patient is at high risk of thrombosis, heparin should be given thereafter, discontinued 4 hours before surgery, reintroduced as soon as possible after the procedure and maintained until INR >2.0; **Class I, Level of Evidence D.**
- Patients submitted to dental treatments that cause local bleeding can rinse their mouths with aqueous solutions of tranexamic or epsilon-aminocaproic acid without the need to discontinue anticoagulation therapy; **Class I, Level of Evidence D.**

## **Dental Procedures and Prevention of Infective Endocarditis**

In this situation, the physician should consider the patient's susceptibility to infective endocarditis and the likelihood of the procedure contaminating the blood with a microorganism that is capable of causing infective endocarditis.

The dental procedures that are most likely to cause bacteremia are: subgingival placement of antibiotic fibers or strips, teeth extraction, dental implants or reimplants, endodontic and periodontal procedures, placement of orthodontic bands and procedures that cause significant bleeding. High-risk patients should always receive antibiotic prophylaxis when submitted to these procedures.

### **Definitions:**

#### **Levels of Evidence**

- A. Sufficient evidence from multiple randomized trials or meta-analyses
- B. Limited evidence from single randomized trial or non-randomized studies
- C. Evidence only from case reports and series
- D. Expert opinion or standard of care

#### **Class of Recommendation**

**Class I:** Conditions for which there is evidence for and/or general agreement that the procedure/therapy is useful and effective

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**Class III:** Conditions for which there is evidence for and/or general agreement that the procedure/therapy is not useful/effective and in some cases may be harmful

#### **CLINICAL ALGORITHM(S)**

None provided

### **EVIDENCE SUPPORTING THE RECOMMENDATIONS**

#### **REFERENCES SUPPORTING THE RECOMMENDATIONS**

[References open in a new window](#)

#### **TYPE OF EVIDENCE SUPPORTING THE RECOMMENDATIONS**

The type of supporting evidence is identified and graded for most of the recommendations (see the "Major Recommendations" field).

## BENEFITS/HARMS OF IMPLEMENTING THE GUIDELINE RECOMMENDATIONS

### POTENTIAL BENEFITS

- Reduction of risk for perioperative complications and mortality
- Prevention of perioperative complications
- Prevention of perioperative mortality

#### Special Population – Pregnant Women

Better outcome for the pregnant woman and her fetus

### POTENTIAL HARMS

#### Special Population – Pregnant Women

Surgery performed in the first trimester of pregnancy is more associated with higher risks of teratogenesis and miscarriage in the last trimester with a higher risk of preterm birth.

## CONTRAINDICATIONS

### CONTRAINDICATIONS

- Gallium-67 scintigraphy is always contraindicated during pregnancy.
- Epinephrine or other vasoconstrictors are contraindicated in cases of untreated repetitive ventricular arrhythmia or supraventricular tachycardia with rapid ventricular response and should be used with caution in paced patients.
- Vasoconstrictor use is also contraindicated in patients with unstable angina and the hospital may be the most appropriate place for dental treatment in this population. Use epinephrine with caution in patients with hypertrophic cardiomyopathy.
- Vasoconstrictors may also be contraindicated in patients with a recent history of myocardial infarction, patients with severe congestive heart failure, uncontrolled hyperthyroidism and drug addiction.

## QUALIFYING STATEMENTS

### QUALIFYING STATEMENTS

- Data or scientific evidences are not always available to allow all the different situations to be analyzed. As customary in medical practice, minute analysis of the patient and problem and the common sense of the team must prevail.
- The surgical intervention does not finish when the patient is bandaged or leaves the operating room. The concept of the word *perioperative* includes the need for a postoperative surveillance whose intensity is determined by the individual level of risk of the patient.

## IMPLEMENTATION OF THE GUIDELINE

### DESCRIPTION OF IMPLEMENTATION STRATEGY

An implementation strategy was not provided.

## INSTITUTE OF MEDICINE (IOM) NATIONAL HEALTHCARE QUALITY REPORT CATEGORIES

### IOM CARE NEED

Getting Better  
Living with Illness  
Staying Healthy

### IOM DOMAIN

Effectiveness  
Safety

## IDENTIFYING INFORMATION AND AVAILABILITY

### BIBLIOGRAPHIC SOURCE(S)

Committee on Perioperative Evaluation (CAPO), Brazilian Society of Cardiology. Specific assessment. In: I guidelines for perioperative evaluation. Arq Bras Cardiol 2007;89(6):e186-94. [38 references]

### ADAPTATION

Not applicable: The guideline was not adapted from another source.

### DATE RELEASED

2007

### GUIDELINE DEVELOPER(S)

Brazilian Society of Cardiology

### SOURCE(S) OF FUNDING

Brazilian Society of Cardiology

### GUIDELINE COMMITTEE

Not stated

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## **FINANCIAL DISCLOSURES/CONFLICTS OF INTEREST**

Not stated

## **GUIDELINE STATUS**

This is the current release of the guideline.

## **GUIDELINE AVAILABILITY**

Electronic copies: Available in Portable Document Format (PDF) from the [\*Journal of Arquivos Brasileiros de Cardiologia\*](#).

## **AVAILABILITY OF COMPANION DOCUMENTS**

None available

## **PATIENT RESOURCES**

None available

## **NGC STATUS**

This NGC summary was completed by ECRI Institute on June 2, 2008. The information was verified by the guideline developer on July 2, 2008.

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